WHAT IS CLAIMED IS:

1. A method for making a crosslinked polymer composition capable of forming a hydrogel comprising:

providing a first composition comprising at least one thiosulfonate polymer derivative, wherein said at least one thiosulfonate polymer derivative comprises at least three thiosulfonate functional groups;

exposing said first composition to a base under conditions sufficient to initiate crosslinking between said thiosulfonate functional groups; and

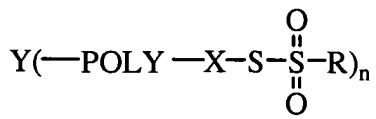
allowing said crosslinking to proceed to thereby form said crosslinked polymer composition capable of forming a hydrogel.

2. The method of claim 1, wherein said first composition is substantially free of a crosslinking agent or redox catalyst.

3. The method of claim 1, wherein said at least one thiosulfonate polymer derivative is a multi-arm thiosulfonate ester of a water-soluble polymer.

4. The method of claim 1, wherein said first composition comprises a single thiosulfonate polymer derivative component capable of crosslinking upon exposure to a base.

5. The method of claim 1, wherein said thiosulfonate polymer derivative has the formula:



wherein POLY is a water-soluble polymer, (n) is 3 to about 25, X is a linking group, Y is a moiety derived from a molecule having at least three nucleophilic groups, and R is hydrogen, or an organic radical.

6. The method of claim 1, wherein POLY is a poly(ethylene glycol); (n) is 4; X is selected from the group consisting of alkylene groups, alkylene amides, alkylene esters, and alkylene ethers; and Y is derived from a moiety selected from the group consisting of glycerol, oligoglycerols, pentaerythritol, carbohydrates, cyclodextrin, and amine analogues thereof.

7. The method of claim 1, wherein said first composition further comprises at least one active agent.

8. The method of claim 7, wherein said at least one biologically active moiety is covalently linked to said at least one thiosulfonate polymer derivative.

9. The method of claim 7, wherein said at least one biologically active moiety is entrapped within the crosslinked polymer composition during said crosslinking.

10. A crosslinked polymer composition produced according to the method of claim 2, wherein said crosslinked polymer composition is substantially free from by-products of crosslinking agents or redox catalysts.

11. A method for forming a crosslinked polymer composition capable of forming a hydrogel having desired physical properties from a single component hydrogel-forming composition, said method comprising:

providing a single component hydrogel-forming composition comprising a thiosulfonate polymer derivative, wherein said thiosulfonate polymer derivative comprises at least three thiosulfonate functional groups;

exposing said single component hydrogel forming composition to a base under conditions sufficient to initiate crosslinking between said thiosulfonate functional groups; and

allowing said crosslinking to proceed and thereby form said crosslinked polymer composition capable of forming a hydrogel.

12. The method of claim 11, wherein said base has a pH ranging from about 7.4 to about 9.0.

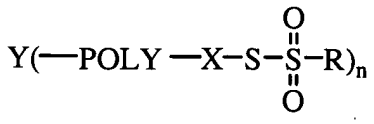
13. The method of claim 11, wherein said single component hydrogel-forming composition is exposed to said base at a temperature ranging from about 20 °C to about 50 °C.

14. The method of claim 11, wherein said thiosulfonate polymer derivative is present in said single component hydrogel-forming composition at a concentration ranging from about 2% w/v to about 25% w/v.

15. A crosslinked polymer composition capable of forming a hydrogel having desired physical properties from a single component hydrogel forming composition produced according to the method of claim 11.

16. The crosslinked polymer composition of claim 15, wherein said crosslinked polymer composition exhibits a gel time of between about 1 min and about 10 hours.

17. The crosslinked polymer composition of claim 15, wherein said single component hydrogel forming composition comprises a thiosulfonate polymer derivative having the formula:

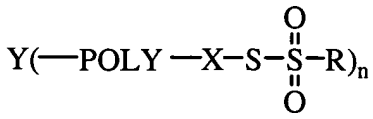


wherein POLY is a water-soluble polymer, (n) is 3 to about 25, X is a linking group, Y is a moiety derived from a molecule having at least three nucleophilic groups, and R is hydrogen or an organic radical.

18. The crosslinked polymer composition of claim 15, wherein said single component hydrogel-forming composition comprises a thiosulfonate polymer derivative and wherein said thiosulfonate polymer derivative is covalently linked to at least one active agent.

19. The crosslinked polymer composition of claim 15, wherein at least one active agent is entrapped within said crosslinked polymer composition.

20. A compound having the formula:



wherein POLY is a water-soluble polymer, (n) is 3 to about 25, X is a linking group, Y is a moiety derived from a molecule having at least three nucleophilic groups, and R is an organic radical.